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ABSTRACT

A study examined when young children begin processing phonetic cues for reading. Subjects were kindergartners selected and classified by their ability to read preprimer and primer level words on a 40-word list--prereaders (0-1 words known), novices (1-11 words known), and veterans (11-36 words known). Subjects were given reading practice with words with simplified phonetic spellings and with words that achieved visual distinctiveness although no letters corresponded to sounds. Children were told the spoken word corresponding to each spelling and were given several trials to learn the words, and then administered a posttest. Results indicated that novices and veterans learned to read the phonetic spellings more easily than the visual spellings, while results were the opposite for prereaders. Findings suggest that phonetic cue reading is possible at the outset when children first begin reading words out of context, and that visual cue reading characterizes how prereaders read words. Findings also suggest that learning to spell contributed to beginners' ability to read words, enabling children to process phonetic cues in the words. Since word reading and word spelling skills develop in stages, classroom instruction and practice in invented spelling promote learning to spell and read words. Allowing children to practice what they know about the English orthographic system by inventing spellings of words does not appear to inhibit development but rather to enhance progress in learning to spell and read. (Tables of data and figures are included and references are attached.) (NKA)

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MOVEMENT IN WORD READING AND SPELLING: HOW SPELLING CONTRIBUTES TO READING

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Abstract

Word reading and word spelling skills are described as developing in stages. Evidence indicates that teaching beginners to spell phonetically facilitates word reading and also may facilitate memory for the correct spellings of words. It is suggested that instruction and practice in inventive spelling promote learning to spell and read words.

MOVEMENT INTO WORD READING AND SPELLING: HOW SPELLING CONTRIBUTES TO READING

During the preschool years, many children are introduced to literacy through a variety of experiences. They watch adults reading signs and labels, they listen to stories read by adults and talk about the stories afterwards, they learn to "pretend read" the stories they have heard many times, they learn what print looks like even though they are not able to read what it says, they learn about letters by studying alphabet books and by watching "Sesame Street" on television, they scribble notes that resemble written language, they learn to write their names. Although young children may learn much about print and its functions, they may or may not become independent readers themselves during these early years (Mason & Allen, 1986).

Our research has focused on how young children move into independent word reading, that is, how they become able to process print so that they can read words without assistance from pictures and other context cues. Which early literacy experiences enable children to do this? What knowledge and skills does it take to begin reading independently? Are specific prerequisites needed? How does learning to write contribute in learning to read?

It is important to understand how skill at reading words develops (Ehri, 1980; Rumelhart, 1977; Stanovich, 1980). Mature readers are thought to use two sources of information. The first is *lexical* knowledge. As a result of experiences reading specific words repeatedly, information about spellings of these words is retained in memory and associated with their pronunciations and meanings. These words are then read by retrieving these associations from memory. With experience, this type of word reading becomes rapid and automatic, requiring little attention or effort (LaBerge & Samuels, 1974; Perfetti, 1985; Stanovich, 1980). The other source of information consists of *orthographic* knowledge, that is, how the spelling system works, its rules and regularities, how spellings map phonemes and morphemes in speech, etc. (Chomsky, 1970; Venezky, 1970). This information enables readers to pronounce words and nonwords they have never seen before by using their knowledge of the system to transform spellings into pronunciations, for example, pronouncing the nonword CIBE as /sayb/ (Venezky & Johnson, 1973). For many readers, this knowledge may be implicit rather than explicit. That is, they may have working knowledge of the system but may not be able to state what rules or regularities they apply.

Children become able to read words using lexical knowledge before they acquire sufficient orthographic knowledge to read words by transforming letters into sounds (Ehri & Wilce, 1983). Based on research (Gough & Hillinger, 1980; Gough, Juel, and Roper/Schneider, 1983; Mason, 1980; and Ehri & Wilce, 1985), three stages of lexical development have been distinguished. The earliest approach to reading words is *visual cue reading*. Words are processed like pictures as strictly visual forms. The cues selected have nothing to do with sounds in the word. Children select some distinctive visual feature in or around the word, associate it with the word, and store this association in lexical memory. For example, the tail at the end of "dog" or the humps in the middle of "camel" might be selected. More often though the visual cues selected are only arbitrarily related to words, for example, two posts in the middle of "yellow."

Readers have difficulty using visual cues to read many words reliably over time. Because the cues are arbitrarily related to words, they are easily forgotten. Because different words have similar visual cues, words are mixed up. Mason (1980) gave visual cue readers practice reading a list of 10 words. They learned to read only three or four of the words, they could not read the words when the case of the letters was altered, and they forgot most of the words after a 15-minute delay.

Masonheimer, Drum, and Ehri (1984) found that visual cue readers do not pay much attention to the letters in words they can read. These researchers showed samples of environmental print (e.g., Stop, McDonalds) to preschoolers in order to select children who were experts at reading the signs. Then

they removed logos and other non-alphabetic visual cues from the signs and showed them again to the children. This time the children were unable to read the signs, indicating that expert sign readers were "reading the environment" rather than the print. Second, the researchers altered one of the letters in each label (e.g., Pepsi changed to Xepsi printed on its logo) and showed the labels to their experts. Most children failed to notice the print change even when they were asked whether there was a mistake in the sign and even when the original and altered signs were placed side by side. Masonheimer et al. (1984) suggest that one reason why young children do not process letters in environmental signs when they learn to read them is that logos and contextual cues provide more salient visual cues that are sufficiently reliable to preclude the need to notice letters in the signs. Another reason is that visual cue readers may not know letters well enough.

Once children learn the shapes and names or sounds of alphabet letters, they are capable of advancing to the next stage of word reading. This is called *phonetic cue reading* and entails reading words by forming and storing in memory associations between some of the letters seen in a word's spelling and some of the sounds heard in its pronunciation. The phonetic cues selected to form associations are drawn from readers' knowledge of letter names as well as sounds. To illustrate, readers might learn to read the word "jail" by associating the names of the letters j and l with these sounds heard in the word. These associations are stored in memory and retrieved to read the word the next time it is seen (Ehri & Wilce, 1985, 1987a). This is not visual cue reading because it is the letter-sound unit rather than just the visual letter itself that provides the mnemonic link between spellings and pronunciations.

Phonetic cue reading is more effective than visual cue reading because the associations between spellings and pronunciations are systematic, rather than arbitrary, and thus are easier to remember. However, phonetic cue reading has its problems. Only some of the letters in spellings, not all, are associated with sounds in pronunciations. The first letter or the first and final letters may be processed, allowing the possibility that words with the same letter cues will be confused. Also because phonetic cue readers lack full knowledge of the orthographic system, they cannot decode novel words and so are limited to reading only those words they have read before by accessing them from memory.

The most mature stage of word reading, referred to as cipher reading by Gough and Hillinger (1980), emerges when children acquire more complete knowledge of the orthographic system: how to segment pronunciations into phonemes; which letters typically symbolize these phonemes. Cipher readers can apply their knowledge of the system to decode unfamiliar words. And they can store specific printed words in memory by forming associations between all of the letters in spellings and sounds in their pronunciations (Ehri & Wilce, 1987a). Achieving this stage is thought to require instruction and extensive experience learning how letters correspond to sounds.

It is apparent that children begin paying attention to alphabetic cues in words at the phonetic cue reading stage. Chall (1983) and Biemiller (1970) among others have identified this as a very important initial step enabling children to begin acquiring independent word reading skill. Chall (1983) describes this as the step when readers become "glued to print." It is at this stage, when printed words become easier to distinguish and remember, that word reading becomes more reliable. At what point during development does phonetic cue reading become possible? As soon as children become able to read a few words consistently out of context? Or only after children have learned to read 30-40 words using visual cues?

We wanted to find out when young readers begin processing phonetic cues (Ehri & Wilce, 1985). We selected and classified kindergartners into three groups based on their ability to read preprimer and primer level words on a 40-word list: children who recognized 0 or 1 word were called *prereaders*; children who read from 1 to 11 words were called *novices*; and children who read 11 to 36 words were called *veterans*. Then we gave all of the children practice reading two kinds of word spellings (see Table 1). One set consisted of simplified phonetic spellings, for example, JRF to spell "giraffe" in

which the name of every letter contained a sound found in the word's pronunciation. The other set consisted of spellings that had no letters corresponding to sounds, for example, WBC to spell "giraffe," but which achieved visual distinctiveness with different letters used across the spellings and with letters varying in size and in ascending or descending positions. The children were told the spoken word corresponding to each spelling, and they were given several trials to learn the words. Incorrect readings were corrected.

[Insert Table 1 about here.]

We were interested in whether each of the three beginning reader groups would find the visual spellings or the phonetic spellings easier to learn. We reasoned that if beginning readers use visual cues in learning to read their first 30-40 words, then the novices along with the prereaders should learn the visual spellings more easily. However, if phonetic cue reading is used at the outset to read even a few words, then novices, along with the veterans, should learn to read the phonetic spellings more easily. Results presented in Figure 1 supported the latter hypothesis. Novices and veterans learned to read the phonetic spellings more easily than the visual spellings, whereas the prereaders learned to read the visual spellings more easily than the phonetic spellings. These differences were statistically significant. From these results, we concluded that phonetic cue reading is possible at the outset, when children first begin reading words out of context, and that visual cue reading characterizes how prereaders read words.

[Insert Figure 1 about here.]

In this study, we measured subjects' ability to identify the names and sounds of alphabet letters and found a big difference. Novices, but not prereaders, knew the names of almost every letter (M = 25 vs. 20 correct out of 26 maximum) and sounds of most of the letters (M = 20.6 vs. 6.7 correct). These differences were statistically significant. In other studies we have observed letter mastery to distinguish preschoolers who can read isolated words from those who cannot (Masonheimer et al., 1984). Knowing the names of letters is one of the best predictors of beginning reading achievement, better even than IQ (Chall, 1967; Ehri, 1983; Share, Jorm, Maclean & Matthews, 1984). This may be because beginners must know the letters before they can shift from visual to phonetic cue processing of words.

If it is important for children to know phonetic cues in order to read words, how might this be strengthened? One way, of course, is to teach children letter names or sounds. Another possibility is to give the children practice pairing letters with sounds, but more than knowledge of letter-sound relations is involved in phonetic cue reading. Readers must also be able to detect sound segments in pronunciations of words so that letters in spellings can be associated with these sounds. One activity that develops letter-sound knowledge and also sound segmentation skill is learning to spell. We decided to investigate whether training beginners to spell words phonetically would facilitate their ability to use phonetic cues to read words, and whether this training would be superior to letter-sound practice (Ehri & Wilce, 1987b).

The children selected for study were kindergartners who were able to read only a few words on a preprimer list (M = 4 out of 22 words), who knew 9 of the 10 letters to be used during training, but who could neither spell words with consonant clusters nor read any of the words to be taught in the word learning task. Children were randomly assigned either to the experimental group that received spelling training or to the control group that received letter-sound training. The experimental group was taught to use letter tiles to spell words and nonwords consisting of CVs (C = consonant, V = vowel), VCs, CVCs, CCVs, CCVCs, VCCs, and CVCCs. A total of 10 sounds, six consonants and four long vowels, were practiced in spelling these words. Examples of the words are: NA, EL, SIP, STO, STAK, ENS, TINS, each pronounced with a long vowel and spelled phonetically. The control group practiced matching the same 10 letter tiles to their isolated sounds for many trials. Following training, the children were given a posttest in which they were taught to read a list of 12 similarly

spelled words and were given seven trials to learn to read them. Examples of words taught are SALS (sails), SEL (seal), SLIS (slice), SOP (soap), STON (stone). (Printed forms appear in capital letters, pronunciations in lower case.) We wanted to see whether the subjects who received spelling training would learn to read more of the words than control subjects. If so, this would indicate that spelling training facilitates phonetic cue reading.

The results are presented in Figure 2. Clearly, children who received spelling training learned to read the words more effectively than those who had been trained in letter sounds. We also examined how children read the words. From Figure 2 it is evident that neither group learned to read most of the words. One reason was that the words were similarly spelled and hard to distinguish for subjects who were using only partial letter cues. We calculated correlations between the extent of letter overlap shared by each word with the other words and the number of subjects reading each word correctly at least twice. Results revealed high negative values, particularly among spelling-trained subjects (r = -.91 for trained, -.60 for controls), indicating that words sharing more letters with other words were harder to learn to read. Additional evidence that subjects were using partial phonetic cues to read words came from analyzing their misreadings. The proportion of letters that were given plausible pronunciations was significantly higher among spelling-trained subjects than among control subjects, M = 66% vs. 49%, indicating that trained subjects were processing more phonetic cues.

[Insert Figure 2 about here.]

One advantage provided by spelling training was that it enabled subjects to segment pronunciations into their phonetic constituents. This was evident on a posttest where trained subjects divided more nonsense words correctly into sounds than control subjects. Segmentation differences favoring experimentals were especially large on consonant clusters (e.g., ST-, SL-, SN-, -TS, -LS, -NS) which are known to be hard for novice readers to divide into sound (Treiman, 1985). In the word learning task, trained subjects also learned to read more words with consonant clusters than controls.

From this study, we concluded that learning to spell contributed to beginners' ability to read words and that the reason was that it enabled children to process phonetic cues in the words. Phonetic cue processing was probably helped by the phonetic segmentation training that children received as part of spelling instruction. The advantage we observed was not due to superior letter-sound knowledge, because both groups practiced letter-sound relations. Also it was not a result of superior skill sounding out and blending words. Experimental subjects did not use this strategy more successfully than control subjects to read words because they were not very good at it; spelling training does not teach blending skill.

Other studies also provide evidence that reading and spelling are highly correlated: In samples of first graders, the correlations ranged from .68 to .86 (Roper/Schneider, 1983; Morris & Perney, 1984); in second graders, the correlation was .66, and in fifth graders it was .60 (Shanahan, 1984). Chomsky (1979) showed how learning to write can precede and facilitate learning to read. Thus, our findings corroborate and extend earlier findings.

In drawing conclusions, we should point out that we have designed our studies to examine processes that are important in learning to read and spell, not to identify specific methods to teach these processes. In the spelling study, although we used a highly structured task that included nonsense syllables to teach children to spell, we are not suggesting that this is necessarily the way to handle phonetic spelling instruction in classrooms. Which methods are most effective remain to be determined. Our guess is that those methods that engage children in meaningful writing activities as well as teach them how to make their spellings more phonetic will turn out to be the most effective, as well as the most motivating.

We believe that our results carry implications for instruction. They suggest that at the outset, learning how to spell phonetically can help a child learn to read. However, we recognize that there

may be problems in attempting to implement our suggestion. English words are typically not spelled completely phonetically, so children who practice writing real words will misspell the words. In addition, when novices first begin generating spellings of words, their inventions will necessarily deviate substantially from correct forms because they are at an early, immature stage of spelling development. In fact, there may be a prolonged period in which misspellings predominate before children become able to remember easily the correct spellings of words. Primary grade teachers may be reluctant to allow their students to misspell words because they fear that errors will persist and the children will develop into poor spellers. An alternative approach is to have beginners rote memorize correct spellings of words. However, because English spellings are variable and not strictly regular, beginners' knowledge of the spelling *system* may not develop from this sort of practice. Juel and Roper/Schneider (1985) found that children who learned decoding rules but then practiced reading words that did not conform to the letter-sound relations they had been taught did not learn to apply a decoding strategy in reading words. The same may be true in learning to spell.

To assess whether teachers' concerns about allowing students to misspell are legitimate, it is important to examine how people generate spellings of words and how spelling skill develops in children. People are thought to draw from two sources of information in spelling words (Ehri, 1986; Jorm, 1983; Simon, 1976; Simon & Simon, 1973): (1) information about specific words stored in memory, and (2) knowledge about how the general spelling system works. Spellers acquire both sources of information from their reading, as well as their spelling experience. They remember which letters symbolize sounds in the conventional spellings of specific words and also visual properties of the words such as length. Spellers also learn which letters typically symbolize particular sounds across many words, how to segment pronunciations into sound units, typical positions of letters in words, and so forth. When they spell a word, spellers first look in memory for specific information about the word. If it is not there, or only partially there, then they use their general knowledge to invent a spelling or to supplement the recalled spelling.

It takes several years for children to develop spelling proficiency. Not only must they learn how the general system works, but also they must store spellings of many specific words in memory. The course of spelling development can be illustrated with the spellings listed in Table 2. These were produced by a boy of average reading/spelling ability during first and second grades. At the time of the first test, he could read only a few words in isolation. By the fifth and final test, he was reading words at grade level. The spelling test of 20 words was given five times during the two-year period by the teacher. These words were never taught directly to students. When they wrote, children in this classroom were encouraged to invent spellings. They encountered correct forms of words mainly in their readings.

[Insert Table 2 about here.]

In Table 2, correct spellings produced by the child are underlined. It can be seen that the number of correctly spelled words increased from the first to the fifth test, slowly at first and then dramatically at the end: 0, 1, 1, 6, and 16 words correct, respectively. It is noteworthy that although few words were spelled correctly during the first three tests, the quality of the spellings changed markedly, from forms that bore little resemblance to the words to forms that symbolized a number of sounds in the words. This indicates that much happens to spelling ability early in the process before children develop much skill at spelling words correctly. In fact, consistently correct spellings may be fairly late to develop, as they were with this child.

Researchers have examined the kinds of spellings that young children produce when they do not know the correct spellings of the words (Ehri, 1986; Gentry, 1982; Henderson, 1981; Morris & Perney, 1984). These spelling inventions have been analyzed to identify four stages of development in knowledge about the orthographic system: precommunicative, semiphonetic, phonetic, and morphemic. Each stage denotes a discrete period of development. However, its boundaries may

overlap with the next stage. Examples of spellings characterizing the first three stages can be drawn from Table 2.

The earliest stage of spelling development is *precommunicative* when children produce scribbles, or strings of randomly selected letters, or numbers to represent words or sentences. At this stage, only a few letters may be known and they may not be differentiated from numbers. When spellers select letters for words, it is not because they correspond to sounds. In Table 2 a few precommunicative spellings were produced at Test 1: P (tack), KO (muffin). This stage may begin very early when preschoolers begin noticing what written language looks like and where to find it. This stage parallels the visual cue stage of word reading.

The next stage is *semiphonetic* and begins when children learn the names or sounds of letters and use this knowledge to select letters for their spellings. At the onset, only one or two of the letters may correspond to sounds. However, as children gain more experience with print, they become able to detect and spell more sounds in words. At Test 1 in Table 2, 40% of the spellings produced were semiphonetic and most included only one letter corresponding to a sound. At Tests 2 and 3 in Table 2, 70% to 85% of the spellings produced were semiphonetic and most included two letters symbolizing sounds. Examples of semiphonetic spellings are BP (buzz), PL (pickle). Letter names may be the basis for selecting letters, for example, Y (named "wie") used to spell "wife" as YUF, and as Read (1971) reported, H (named "aich") used to spell "chicken" as HKN. This stage parallels the phonetic cue reading stage in which children use partial letter-sound cues to read words.

Although children's letter choices may violate spelling conventions, they are nevertheless logical and indicate that learners are attempting to use what they know about letters to figure out how the spelling system works. Nonconventional choices such as Y for "w" and H for "ch" typically appear during the course of development but subsequently disappear as learners discover that the conventional system works another way. Note in Table 2 that YUF is changed to WIF at the next test period.

At the semiphonetic stage, children may know very few correct spellings of words. In Table 2, no words were spelled correctly during Test 1 and only one word was spelled correctly during Tests 2 and 3. The fact that the correctly spelled words were different across the two tests (hill, rag) indicates that memory for correct spellings may be unstable during this stage.

Third is the *phonetic* stage when children become able to produce spellings that contain letters for all of the sounds in words. In Table 2, some phonetic spellings are evident at Tests 2 and 3 (10% to 25%), but phonetic spellings do not predominate until Test 4 where it can be seen that 91% of the spellings are phonetic. One of the most important acquisitions distinguishing the phonetic stage from the semiphonetic stage is learning to spell vowels. In Table 2, vowel accuracy rose from 40-50% at Tests 2 and 3 (the semiphonetic stage) to 100% accuracy at Test 4 (the phonetic stage).

During the phonetic stage children begin to believe that every sound they detect in a pronunciation requires a letter in the spelling. In stretching out pronunciations to spell words, children may even find extra sounds not symbolized in conventional spellings but detectable in pronunciations, for example DOKTDR (doctor) in Table 2. However, detection of the preconsonantal nasal in words such as "camp," "bend," and "sink," is late to develop, because the nasal is not articulated separately but rather overlays the vowel (Read, 1971).

Acquiring the idea that words consist of a sequence of phonemes is a very important insight for the development of reading as well as spelling skill. In fact, phonemic awareness is one of the best predictors of how well children learn to read (Bryant & Bradley, 1985; Juel, Griffith & Gough, 1986; and Share, 1984). According to our theory, phonemic awareness is the capability that enables children to analyze and store complete spellings of words in memory (Ehri, 1980, 1984).

It may be that children who know how to spell words phonetically have a much easier time remembering the correct spellings of English words. Some evidence for the relationship between phonetic spelling ability and memory for correct spellings is apparent in Table 2. It was not until the final test (Test 5) that this child was able to spell the majority of the words, 80%, correctly. At the earlier test, only 30% of the words were correct. Interestingly, correct spellings surged only after his ability to spell words phonetically matured (at Test 4). This suggests that children may need to learn how the orthographic system works phonetically before they become able to store the correct spellings of very many English words in memory. Because English words vary in which letters symbolize sounds across words (e.g., "sit" vs. "city") and in whether all the letters symbolize sounds, knowing the phonetic system may enhance memory for letters that are instances of regularities and may reduce the number of letters that need to be remembered as variations or deviations. For example, it may be easier to remember that "hill" has two l's, that "listen" has a silent t, and that "city" is spelled with c rather than s if the learner knows the system and can recognize how the other letters in the word symbolize sounds. Note that "hill" was spelled correctly at Test 2 but was subsequently forgotten, indicating that memory for spellings may be unstable if the phonetic system has not been mastered.

Another interesting observation in Table 2 is that most of the misspellings were not repeated from one test period to the next. In fact, 90% changed. The few that did not change were phonetic spellings (WIF, TAC, KIS, NIS) that became correct by the final test period. This indicates that, contrary to the beliefs of some teachers, children may not remember their misspellings, that misspellings may not linger in memory or delay the acquisition of correct spellings. Because children's knowledge of the system is developing, their inventions would not be expected to remain the same but rather to change, reflecting the growth that has occurred in their systematic knowledge.

In a study to examine whether producing misspellings at the outset of learning delays learning the correct spellings of words (Ehri, Gibbs, & Underwood, in press), children and college students were taught the correct spellings of a set of made-up words. Before they studied correct spellings of the words, half of the subjects invented their own spellings which were incorrect. Results showed that spelling errors had no deleterious effects on learning correct forms. Both groups learned correct spellings with equal ease.

Returning to our description of the stages of spelling development, the final stage is termed the *morphemic* stage because spellers begin recognizing and using word-based spelling patterns when these are seen as more appropriate than phonetic spellings; for example, spelling past tense verbs consistently with -ED rather than according to their sounds, WOCHED rather than WOCHT for "watched." This stage is thought to emerge after children have learned the conventional spellings of several specific words and begin recognizing spelling patterns that recur across words. None of the misspellings in Table 2 exhibits morphemic-stage characteristics.

According to our stage theory of development, it is natural for beginning reader/spellers to misspell words. Learning about the English orthographic system requires time and experience. Allowing children to practice what they know about the system by inventing spellings of words does not appear to inhibit development but rather to enhance progress in learning to spell and read. This may be particularly true if children receive instruction in how to generate spellings that are phonetic, as our research has indicated. In sum, more research is needed to substantiate the picture of spelling development and its relationship to reading portrayed above. Some of the conclusions are based on data that is preliminary. However, our characterization is plausible and consistent with the evidence to date.

In conclusion, we think that spelling contributes to the development of reading and likewise that reading contributes to spelling development when the two are intertwined in curricula taught in schools. Writing draws learners' attention to sounds in words and to letters that might symbolize those sounds. This creates expectations about how spellings might be structured and makes learners

more interested in the spellings of specific words as well as how the general spelling system works. Reading exposes learners to the conventional spellings of words and indicates which of the various possibilities are "correct." Reading provides the input learners need to store the correct spellings of specific words in memory and also to figure out how the general system works. Thus, reading directs writing toward more conventional forms, and writing enhances readers' interest in and grasp of the alphabetic structure of print.

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Table 1

Phonetic and visual spellings taught to prereaders, novices, and veterans. Subjects were taught two sets, the set in the middle and either the set on the left or the set on the right. Words associated with each spelling are listed in parentheses.

Phonetic Spellings	Visual Spellings	Phonetic Spellings
LFT (elephant)	WBC (elephant) (giraffe)	JRF (giraffe)
DIPR (diaper)	xGsT (diaper) (balloon)	BLUN (balloon)
KOM (comb)	uHE (comb) (mask)	MSK (mask)
RM (arm)	Fo (arm) (knee)	NE (knee)
PNSL (pencil)	qDjK (pencil) (scissors)	SZRS (scissors)
HKN (chicken)	YMLp (chicken)	
	YMP (turtle)	TRDL (turtle)

Table 2

Spelling Test of 20 words dictated to one student five times over a two-year period in first and second grades. Correct spellings are underlined.

Words	Test 1 grade: 1.3	Test 2 1.6	Test 3 1.9	Test 4 2.3	Test 5 2.8
rag	1	RG	rag	rag	rag
buzz	BP	BZ	Boz	buz	buzz
lid	E	LD	lad	lid	lid
six	6	SS	sis	siks	six
game		GEM	gam	gars	game
nice	SAT	Nis	nis	nis	nice
doctor	DA	DOD	did	doktdr	doctor
view	Y	vyou	vo	vu	view
yellow		yellw	yao	yellow	yellow
kiss	C	kits	kis	kiss	kis
camp	MP	CAP	cap	kap	camp
zero	O	ZW	zio	ziro	zero
hill		Hill	ole	hil	hill
tack	P	TAK	tac	tac	tack
five	5	FAV	fi	five	five
pickle	PO	PL	pal	pikl	pikel
muffin	KO	MN	mufn	mufin	muffen
wife	1	yuf	wif	wif	wife
job		JB	jig	job	job
quick	Ka	KWK	cwy	kwic	quice

Figure Captions

Figure 1. Mean number of phonetic and visual spellings identified correctly in the word-learning task as a function of beginning reader group.

Figure 2. Mean numbers of words read correctly across trials in the word learning task for subjects given phonetic spelling training and for control subjects given letter-sound training.

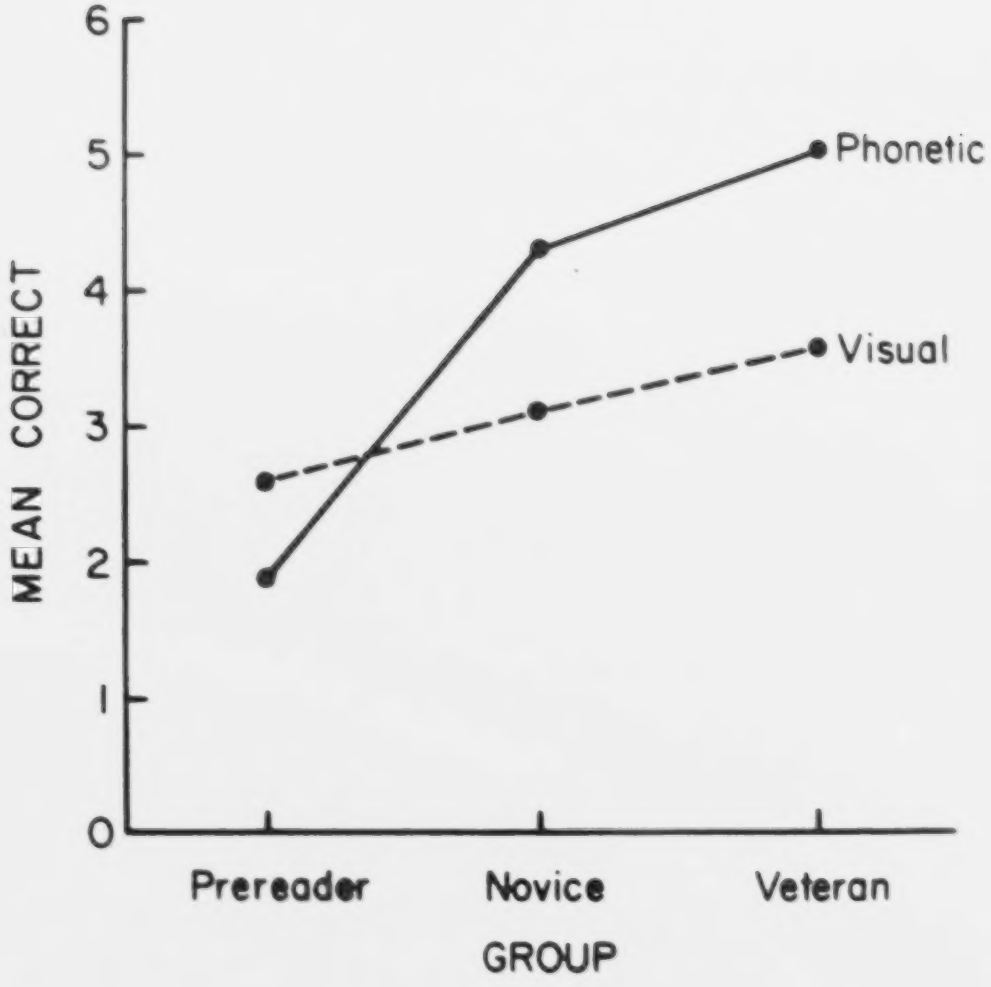
6
5
4
3
2
1
0
MEAN CORRECT
Phonetic
Visual
Prereader
Novice
Veteran
GROUP

Figure 1

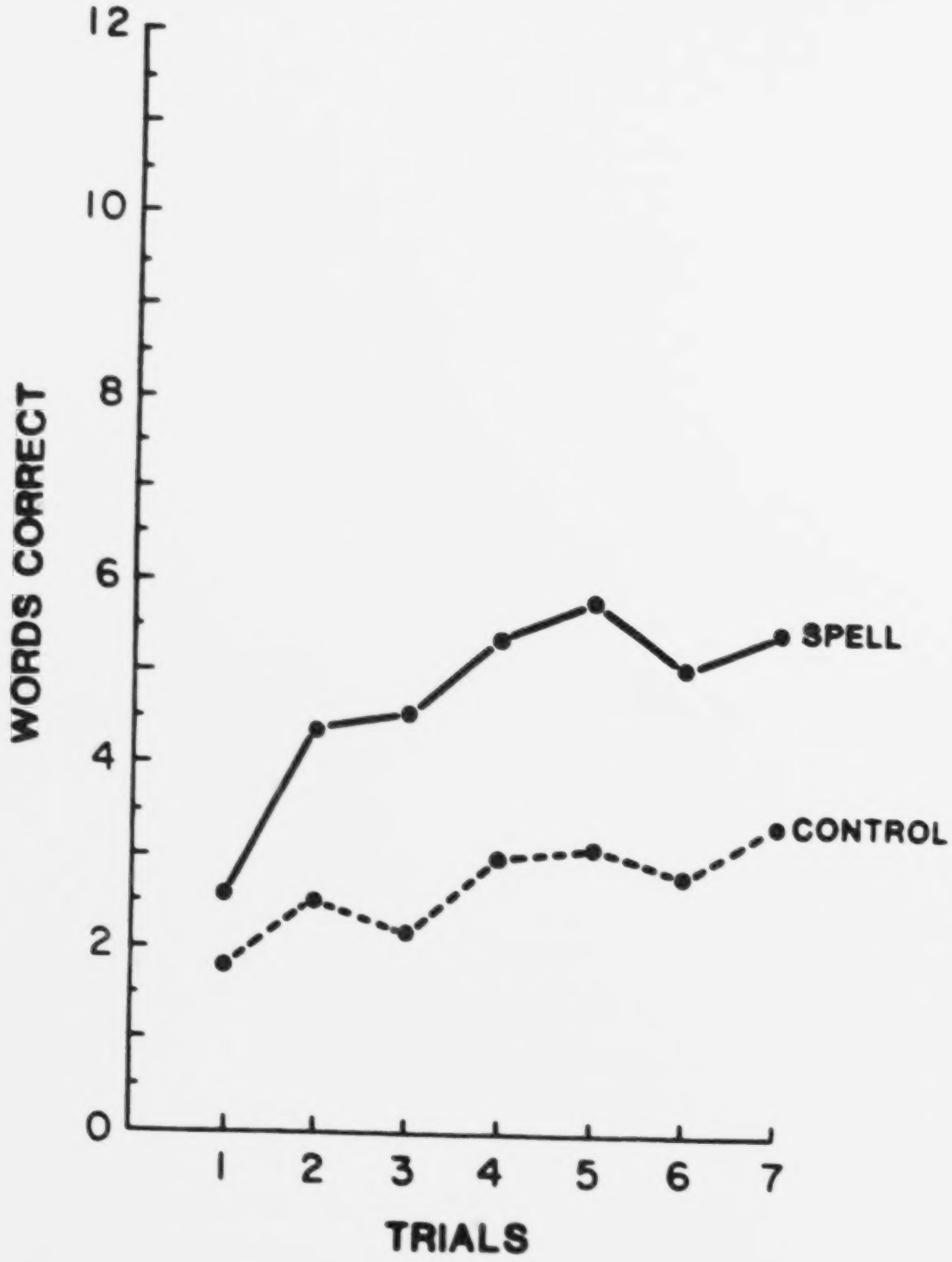

Figure 2